TORNADOES IN MISSOURI [1]

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Mr. W. S. Belden in charge of the Weather Bureau Office of St. Joseph, Mo., reports the occurrence of at least four tornado funnel clouds, three of which were first seen over the Missouri River a little north of White Cloud, Kans., about 6 p. m. May 1, 1930. One moved nearly due east for a distance of about 5 miles and disappeared a little south of Napier, Mo. Another moved northeasterly a distance, approximately, of 11 miles from Mound City to a point north of Maitland, Mo. Each of these two tornadoes advanced rather slowly, with paths of destruction ranging from 50 to 100 yards in width. The third tornado apparently did no damage.

Destruction from a funnel-shaped cloud began 4 miles southwest of Rosendale at about 6:15 p. m. The cloud traveled eastward causing much damage for the first 2 miles, then lifted for a distance of 4½ miles. Again reaching to the ground, it shifted its course to the south and southeastward for 3 miles, after which it continued in an easterly direction with wider path, nearly a mile in places, and undiminished violence, ending approximately 1 mile south of Union Star. This tornado left unusually wide trails of destruction, having a total length of slightly more than 10 miles.

The last of the group of tornadoes was first observed 4 miles north of Filmore at about 6:20 p. m. It moved northeastward 4 miles, then followed a sinuous course eastward for nearly 3 miles, and turned southeastward for about 1 mile on the west side of the One Hundred and Two River Valley, after which it turned eastward again, crossed the river and disappeared one-fourth mile south of Bolckow. The path of the funnel-shaped cloud varied from 100 to 200 yards in width and was continuous for 8 miles.

No lives were lost in these violent storms and no one was seriously injured. Many escapes were made in automobiles when the tornadoes were observed approaching, while others took refuge in caves, cellars, and basements. Approximately 60 homes were damaged or totally destroyed and a much larger number of other farm buildings were demolished. One school building and one filling station were also wrecked. Numerous farms suffered serious losses of machinery, livestock, trees, and fences, but there was little damage to growing crops, such as wheat, oats, and alfalfa. Clearing fields of débris involved much labor.

A conservative estimate of the total loss in both Holt and Andrew Counties as a result of these tornadoes has been placed at $200,000.

[1] While the 2 groups of tornadoes, those of Missouri and Michigan, were directly related to the same cyclonic storm, it is scarcely possible that there was a trail of tornadic storms from northwest Missouri to the eastern shore of Lake Michigan at and near to Grand Rapids. Rather it is preferred to believe that the Michigan group originated in the early hours of May 2 and were due to the same initial cause or causes that produced the Missouri storms about 12 hours earlier.—*Editor.*

NOTES, ABSTRACTS, AND REVIEWS

Limiting values of temperature.—A correspondent calls our attention to a statement which appeared in this REVIEW, 57:513, to the effect that the highest temperature ever recorded with standard thermometers in a standard shelter was 134° F. (56.7 C.) at Greenland Ranch in Death Valley, Calif., and points out that a higher temperature, 136° F., has been reported for Azizia, in Tripoli. Our examination of the temperature records for surrounding stations made some time since led to the suspicion that that reading was more or less in error. Our suspicions have since been confirmed by Dr. G. Hellman, as may be seen from the following excerpt from his article on "Limiting values of climatic elements on earth.[1]

For a long, long time the question as to the highest temperature observed on the earth has been of great interest, but it is difficult to answer it with certainty, since the exact determination of high air temperatures encounters great difficulties on account of the not easily eliminated error due to thermometer exposure or, with aspirated and sling thermometers, on account of radiation from the ground. When the ground in the desert is heated to 158° F. it is difficult to prevent ground radiation from affecting the thermometer. It may, therefore, be assumed as a matter of course that the maximum temperatures recorded are rather too high than too low, and the error may be taken as approximately two-tenths of a degree.

The highest temperature recorded in a fixed shelter (United States shelter of the Stevenson screen type) was 134° on July 10, 1913, in Death Valley, Calif. This unusual heat, which was probably exceeded at the lowest point in the depression, occurred in a 7-day period of extraordinary heat, which gave the following maxima:

July, 1913

8th	128°	11th	129°	13th	131°
9th	129	12th	130	14th	127
10th	134				

In all probability such a series of extreme temperature values rarely occurs even in Death Valley.

In the interior of New South Wales 129° and even 131° were recorded on January 21, 1845 (Hann *Klimatologie* III, 485). At several points in the North American desert, comprising parts of Arizona, California, and New Mexico, for example, Salton, Mammoth Tank, and Mohawk Summit, there have been recorded maxima of 124° to 130° (ibid. III, 425 ff.). At Basra, on the lower Euphrates, 129° was read in July, 1921 (Quarterly Journal, Royal Meteorological Society, 1922, 278). Rohlfs recorded a temperature of 127° in Kauar Oasis (19° N., 13° E.) and values almost as high in the desert region of India; Jacobabad, 126° on July 13, 1897.

We read here and there of still higher temperatures than those just mentioned, but they are either to be immediately characterized as false or so questionable and improbable as not to merit mention here. (See *Meteorologische Zeitschrift*, 1893, pp. 62 and 279.) I believe that we may accept 131° to 133° as the highest observed temperature that is sufficiently authenticated; the temperature of 134° recorded in the shelter in Death Valley is probably 2° or more too high on account of the influence of radiation in heating the shelter, which was at only moderate height above the ground.

Recently I noticed in the Quarterly Journal of the Royal Meteorological Society, 1924, page 324, and in the

[1] Sitzungsberichte der Preussischen Akademie der Wissenschaften. Physikalisch-Mathematischen Klasse. XI. 1925.